National Weather Service
Wichita, KS

Storm Fury on the Plains

Fall Spotter Newsletter

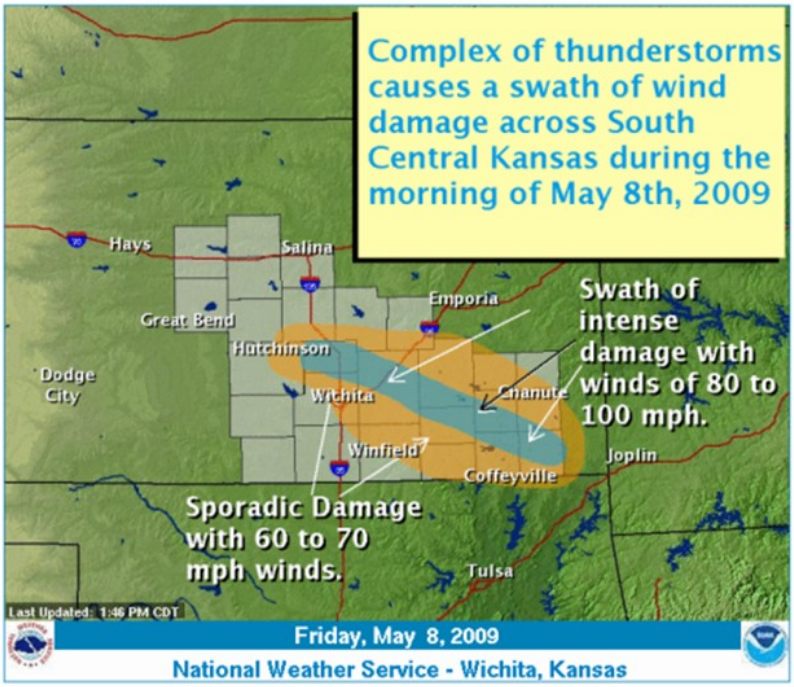
November 2009

Inside this issue:

The Derecho of May 8th, 2009

By: Andy Kleinsasser, Brad Ketcham, Jerilyn Billings, Chris Jakub & Chance Hayes

During the overnight hours of May 8th, 2009, the Sunflower State would once again live up to its notorious reputation of being an epicenter of severe weather worldwide. It was evident to forecasters for days leading up to the night of May 8th that the atmosphere across central and eastern Kansas would become quite supportive for explosive severe thunderstorm development, as buoyant warm and moist gulf moisture would combine with an upper level disturbance approaching from the northwest.



A complex of thunderstorms (called a Derecho) caused wind damage across South Central and Southeast Kansas during the morning hours of May 8th, 2009. Along the most intense swath of damage wind speeds were estimated at 80 to 100 mph.

A complex of thunderstorms developed over northwest Kansas during the late evening hours on the 8th, and intensified once it reached the juicy gulf moisture residing over central and southern Kansas. The strong winds aloft in concert with very unstable air created a rare and intense bow echo-type thunderstorm complex called a ***derecho.*** Derived from the Spanish word meaning ***"straight"***, it is a widespread, long-lived and violent straight-line windstorm that is associated with a fast-moving band of severe thunderstorms in the form of a squall line, usually taking the form of a bow echo.

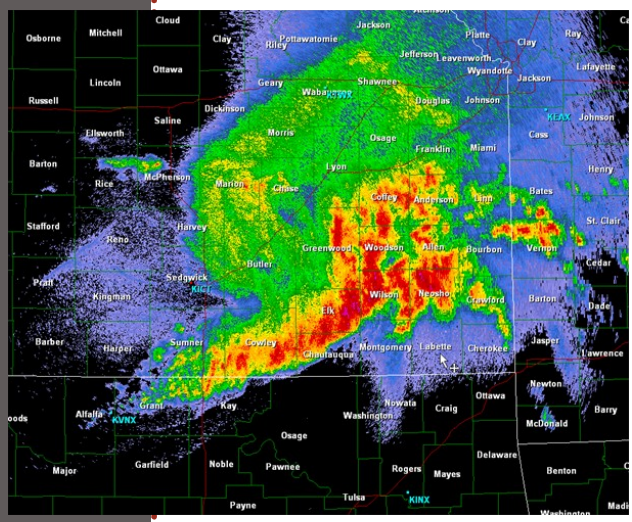
A garage with extensive damage in Cherryvale, KS. Photo courtesy of Perry Lambert.

"From the storm's inception...to it's demise ...nearly 20 hours had elapsed over a distance of roughly 1000 miles"

The derecho caused a swath of destructive straight-line winds of 80 to 100 mph, and produced associated widespread damage from Harvey county, east/southeast across the Flint Hills and southeast Kansas. Periodic large hail and flooding rains also occurred. A seemingly uncountable number of trees and utility poles were downed, and structural damage to homes and businesses was at times quite extensive. Mobile homes were overturned, grain and refinery bins damaged, and thousands were left without power. Additionally, flash flooding closed some roads, and even washed out some bridges. In Wilson county, a New Albany woman was killed when the mobile home she was residing in blew 40 feet and wrapped around a tree, demolishing the mobile home. The deceased woman was found among the wreckage. Total property and crop damage estimates across central, south-central and southeast Kansas (including flood damage) exceeded $32 million.

Tree damage was extensive along the derecho's path. Photo courtesy of Haley Taliaferro.

But that wasn't the end of it; atmospheric conditions remained favorable for the derecho to continue across southern Missouri, southern Illinois, southern Indiana and Kentucky. From the storm's inception across northwest Kansas to its demise over eastern Kentucky, nearly 20 hours had elapsed over a distance of roughly 1000 miles!



A radar image of the derecho as it surged east to southeast across southeast Kansas. Western portions of Wilson county were likely experiencing 80 to 100 mph winds right around the time of this image.

Stephanie Dunten: Wichita's Newest Forecaster

Welcome Stephanie Dunten!

Our newest and youngest member of the WFO Wichita team arrived in late May this year. Stephanie Dunten, from Lafayette, Indiana, has been to three NWS offices before making Wichita her home. While completing her degree in meteorology at Valparaiso University, Stephanie participated in the Student Career Experience Program in which she worked in the Louisville, Northern Indiana, and Chicago offices. Stephanie brings an energetic and a well rounded weather knowledge to the office.

Being from the Midwest, Stephanie has experience all types of weather from severe storms to lake effect snow, and blizzards to flooding. As a student, Stephanie presented several research posters at the Annual National Weather Association Meeting, the Annual American Meteorological Society Meeting, and at the 7th Annual Great Lakes Meteorology Conference. Stephanie was also the President of the Great Lakes AMS/NWA Chapter, and has participated in Storm Chases across the Plains. She also has done volunteer work with Habitat for Humanity and mentoring fellow students.

Stephanie is excited to be a part of the Wichita staff and is ready to handle the Kansas weather.

Your help is needed!

By: Chance Hayes, WCM

The National Weather Service is the main source of weather information for the various media outlets across the country. That holds true right here in Kansas. With the majority of you getting vital weather information via the television or radio, it is imperative that we relay the potentially dangerous weather situations to the media outlets in as real time as possible, so that they may in turn provide you with enough information to make a sound decision. Therefore, we are planning to send out email reminders to you so that you are aware that a possible hazardous weather situation may occur. We are also going to provide you with our toll free phone number in hopes that you will report any hazardous weather that may be occurring in your area. So, when you experience any hazardous weather, please keep in mind how important your report is to your fellow neighbors.

Grass Curing Observers Needed, Your Help Is Requested…

By: Mary-Beth Schreck, General Meteorologist

As temperatures get colder, you will likely notice grass around the area turning brown and getting dried out. This grass begins to burn easily, and a grass fire could get out of control and potentially burn down buildings. At the National Weather Service, we issue daily forecasts that determine the chance that a fire that ignites could become out of control. This product is called the Grassland Fire Danger Index, or GFDI, and it uses a combination of temperature, relative humidity, wind speed, and a curing value to determine the index.

While forecasters already forecast temperature, relative humidity, and wind speed, we need your help to determine the curing value in your area. Curing is a measure of how dry (cured) the grass is, and is essentially the opposite of how green the grass is. These values will range from 0 to 100, with 0 indicating new, green grass, and 100 indicating the brown grasses we see during the winter months. The more cured grass is, the more likely it is to burn.

Once this index is calculated, it is issued and is available to everyone via our website at http://www.crh.noaa.gov/ict/?n=firewx. We use the index internally to determine whether or not a Red Flag Warning (fire weather warning) is needed. Several county officials use the data to determine whether to issue burn permits or burn bans on a day to day basis, and others use it to have additional resources available on critical fire weather days.

"Curing is a measure of how dry (cured) the grass is..."

If you are already a curing observer, we thank you for your diligence, and encourage you to continue reporting your curing values. If you would like to become a curing observer, please send an e-mail to Marybeth.schreck@noaa.gov. Anyone can report curing values to us, as long as you sign up. You will receive a curing guide, which is a small binder that includes information about how grasses cure as well as photos to aid you in determining the curing in your area. The curing values are reported each Monday, as well as any other times you feel the value has changed significantly throughout the week.

Winter weather Safety at Home and Work, Part 1

By: Chance Hayes, WCM

Plan ahead for winter storms by having these in hand:

- **Flashlight** and extra **batteries**
- Battery-powered **NOAA weather Radio**
- **Extra food and water** - high energy food such as dried fruit, nuts and granola bars, and food requiring no cooking or refrigeration
- **can opener**
- **Extra medicine** and **baby supplies**
- **First aid kit**
- **Heating fuel**
- **Emergency heat source**
- **Fire extinguisher**
- **Smoke alarm**

Make sure **pets** have plenty of food, water, and shelter

All Hazards NOAA Weather Radio NOAA's National Weather Service

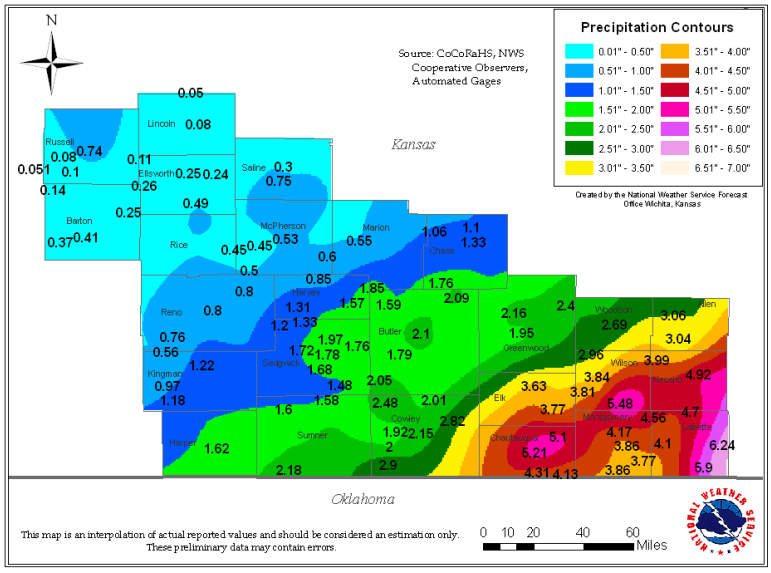
A new graphical look at Weather Observations

By: Stephanie Dunten, Meteorologist Intern

"contoured graphics for snow, snow depth and temperature" will be available in addition to rainfall maps

Beginning October 1, 2009, the Wichita forecast office began issuing a new text product, the LCOICT. This new public product features data in a tabular format from CoCoRaHs observers across the Wichita County Warning Area. CoCoRaHs stands for Community Collaborative Rain, Hail and Snow Network. This network of volunteers, report daily with a 24 hour precipitation total. This measured total includes liquid and frozen precipitation. This data is helpful to forecasters, giving them a more dense network of ground truth observations to compare and use to help with the forecast. This data is especially helpful during heavy and/or extended rainfall events when flooding is a concern.

In addition to this new text product, a graphical image is created and posted on the Wichita NWS webpage showing daily and sometimes storm total precipitation, for rainfall events. This new graphical product is created by a computer software program called Geographic Information Systems or GIS that helps develop objectively contoured precipitation maps. These maps take in to account precipitation amounts from CoCoRaHs observers, COOP observers, and ASOS observations around the Wichita county warning area. Look for these maps after precipitation events on our Wichita NWS webpage (www.weather.gov/wichita). These maps will be on the Wichita home page under the ***Top News of the Day***. These graphical maps are user friendly and make it easy to visualize where the heaviest precipitation has occurred, and to quantify how much precipitation has fallen. Currently, the only contoured map created is for liquid precipitation reports, but check back often as contoured graphics for snow, snow depth, and temperature will be added soon.



Above: Example of a Storm Total Precipitation map from a large precipitation event on October 7-9th, 2009.

In addition to these graphical maps, the raw precipitation data (and soon temperature data) are available to download. These files are available are in CSV

and KML format. CSV files are comma delimited files that can be opened in programs such as excel, notepad or wordpad. KML files are associated with Google and can be used in Google Earth, Google Maps, ArcGIS, and Adobe PhotoShop among other software.

To find out more information and how to help out and join CoCoRaHs go to http://www.cocorahs.org/

"Everyone is potentially at risk during winter storms."

Winter weather Safety at Home and Work, Part 2

By: Chance Hayes, WCM

If you are already **indoors** during hazardous winter weather:

- **Stay inside!**
- When using alternate heat from a fireplace, wood stove, space heater, etc., **use fire safeguards and properly ventilate**
- **Close off** unneeded rooms
- **Stuff** towels or rags in **cracks** under doors
- **Cover windows** at night
- **Eat and drink** - food provides the body with energy for producing its own heat
- **Wear layers** of loose-fitting, lightweight, warm clothing

Everyone is potentially at risk during winter storms. Most fatalities are indirectly related to the storm. People die from traffic accidents on icy roads, heart attacks while shoveling snow, and hypothermia from prolonged exposure to cold.

Picture bottom right: Baseball size hail that fell near Augusta. Picture courtesy of KSNW.

Baseball Hail at the Baseball Game

By: Mary-Beth Schreck, General Meteorologist

Spectators of the Wichita Wingnuts Baseball game got more than they bargained for when baseball sized hail fell for about 30 minutes in downtown Wichita on the evening of July 8th, 2009.

A line of severe thunderstorms quickly developed over far western Wichita around 8:45pm on Wednesday evening, and slowly moved eastward. Hail up to the size of baseballs was reported in downtown Wichita at 9:30pm.

Among other places, large hail fell at the Lawrence-Dumont baseball stadium and in the College Hill neighborhood.

The baseball stadium was right under the core of this storm as it passed over the city. At the stadium, the slow-moving storms caused the baseball size hail to fall for about 30 minutes, covering the field by the time the storm ended. Numerous vehicles were severely damaged in the stadium parking lots, and damage to the stadium itself was also reported. Very large hail, from quarter to baseball sized, fell across the city and impacted many residents, damaging cars and homes. While the large hail at the baseball stadium was the big news, golf ball to baseball sized hail was also reported in Augusta and near Rose Hill later that night and large hail continued to fall as these storms continued on eastward overnight. Many locations reported hail falling for 20 to 30 minutes before ending. In the Wichita metro area the hail is estimated to have caused 12.5 million dollars of damage.

Hail that fell near Douglas and Sheridan in Wichita. Picture courtesy of KSNW.

Roof damage in Eastern Sedgwick County.

Michael (Joe) Rosner Retired

By: Dick Elder, Meteorologist in Charge

Joe Rosner, long time employee of the Wichita National Weather Service Office retired on October 2, 2009. Joe had served his country for over 35 years, nearly 22 of that at the Wichita Office.

Joe, a native of the Paola, KS area. After high school, he joined the Navy, where he began his weather career, serving both as an Observer and Forecaster. During his nearly 8 years in the Navy he was stationed at Key West, Florida, on the aircraft carrier the Midway in the Pacific, and at Guam. While at Guam he met his wife, Debbie who also was in the Navy and worked as a Weather Observer.

Following the Navy he and Debbie moved back to the Paola area where he tried his hand selling insurance for his father. After about a year he realized weather

"Very Large Hail, from quarter to baseball sized, fell across the city..."

Joe Rosner Retires after 35 years of Federal Service, with 22 years at WFO Wichita.

was what he wanted to do for a career and joined the National Weather Service in 1982 as a Radar Observer in Limon, Colorado. He had the good fortune (or is it bad fortune) to be there Christmas Eve 1982 when much of northeast Colorado and the Denver area witnessed one of their biggest blizzards. In the Limon area they went for nearly 24 hours that day where the visibility never got above an eighth of a mile in snow and blowing snow. Snowfall through the region was anywhere from 2-3 feet with drifts over 10 feet. I-70 was closed for several days.

In 1983, Joe transferred to the Sioux City, Iowa Weather Service Office and worked there as a Meteorological Technician. In 1987 he transferred to Wichita. Joe certainly had his fair share of working the "Big Events." He was the Warning Person on June 19, 1990 when a thunderstorm moved out of Kingman County then across Wichita and northeastward to near Emporia. This storm became known as the "Inland Hurricane" with wind gusts of 100-130 mph across the area. The following year, he was the Radar Operator on April 26, 1991 when a tornado developed in Harper County. He tracked it to the northeast as it grew hitting McConnell AFB then moved into Andover. This tornado was on the ground for over 40 miles and caused F5 damage. At the same time another storm moved into Cowley County and caused F4 damage. Most "Weather People" work their whole career and never deal with storms this strong. Joe had 2 of them occurring at the same time!

In 1997, Joe was promoted to the Data Acquisition Program Manager Position. In this role he managed the Cooperative Program across Central, South Central and Southeast Kansas. The Wichita Office has over 150 Cooperative Observers who regularly call in rain and snowfall information. Joe was always there to answer questions or assist our Coop Observers in anyway.

Joe and Debbie have 2 daughters that currently live in the Denver, Colorado area. Their oldest daughter, Stacy, is a Geologist, and she and her husband, became parents of a little girl in September. Audry is Joe and Debbie's first grandchild. The middle child, Kim is a Beauty Operator. Sean, their son, is a senior at KU, majoring in journalism and serves as the Editor of KU's Newspaper.

For the present time Joe and Debbie plan to stay in the Wichita area however I am sure that there will be a number of road trips to Denver to see the "Grand-Daughter." For all of us that know and have worked with Joe, we wish him the best and will miss his hearty laugh and laid back manner.

Joe Rosner analyzing a weather map on his last day of work in October 2009.

Winter weather Safety at Home and Work, Part 3

By: Chance Hayes, WCM

Before starting out in a vehicle:

- **Plan your travel**
- **Check the weather**
- Have **road condition phone numbers** handy
- Carry a **Winter Storm Survival Kit**
- Keep the **gas tank near full** to avoid ice in the tank and
- **Avoid traveling alone**

Let someone know your timetable and route
If you are **stranded in your vehicle** during hazardous winter weather:

- **Stay with your vehicle**
- **Take turns sleeping**
- **Run the motor every hour for 10 minutes** to keep warm
- **Keep windows open a little** to prevent carbon monoxide buildup
- Make sure the **exhaust pipe is not blocked**
- **Tie a bright cloth to the antenna**
- **Exercise periodically** by vigorously moving your arms, legs, toes and fingers
- **Turn on the dome light** while the engine is running to aid rescuers at night

"Before starting out, Plan your Travel and Check the Weather and Road Conditions"

After the snow stops falling, **raise the car hood** to indicate you need help

A good automobile **Winter Safety Kit** includes: cell phone and charger, blankets, flashlight and extra batteries, first-aid kit, knife, high-calorie non-perishable food, extra clothing to keep dry, large empty can to use as emergency toilet, tissues and paper towels, small can and water-proof matches to melt snow for drinking water, sack of sand or cat litter for traction, shovel, windshield scraper and brush, tool kit, tow rope, battery booster cables, water container, compass and road maps.

"Wichita experienced a warm start to the summer....but ended in August as the 15th coolest August on record"

Was Summer 2009, Really that Cool and Wet?

By: Eric Schminke, General Meteorologist

Astronomically speaking, Summer 2009 ended on September 22nd at 4:18 PM CDT for Central and Southeast Kansas. However, from a meteorological standpoint, Summer ended on August 31st, and for most of Central and Southeast Kansas, it was fairly cool and wet. Let's see how cool and wet this past summer was from a historical perspective.

Temperature and rainfall data from Summer 2009 will be examined for three cities: Wichita, Salina and Chanute. First, these summer data will be compared to normal. Second, the data from Summer 2009 will be compared to it's coolest and wettest predecessors.

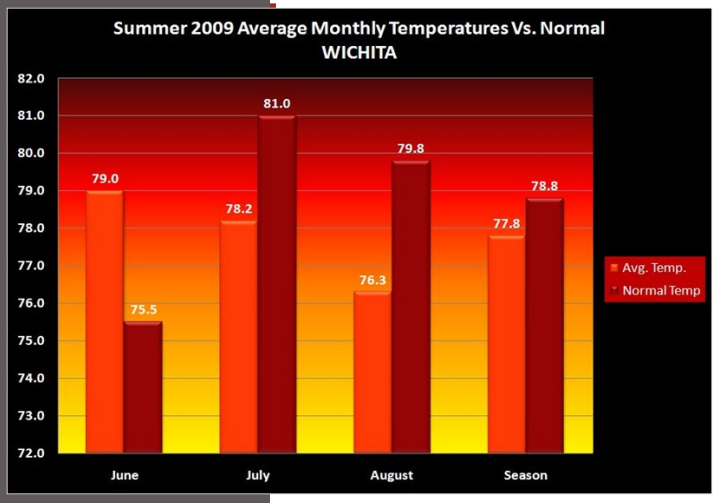


Image 1: Average monthly temperatures for Wichita during summer 2009 compared to normal.

Wichita

The Air Capital averaged 77.8 degrees during Summer 2009; an even 1 degree below normal. (See Image 1) A review of the graph shows that Wichita experienced a warm start to the summer by averaging an even 79.0 degrees during the month of June; 3.5 degrees above normal. This was the 15th warmest June on record. It would be the warmest month for the Summer of 2009, as average temperatures fell to 78.2 degrees in July and to 76.3 degrees in August, the 15th coolest August on record. (To compare 2009 to the 10 coolest summers on record, see Image 2.) These averages were 2.8 degrees and 3.5 degrees below normal, respectively. However, the 77.8 degree average only enabled 2009 to finish in 4-way tie for 41st coolest on record. No doubt June prevented 2009 from soaring through the ranks.

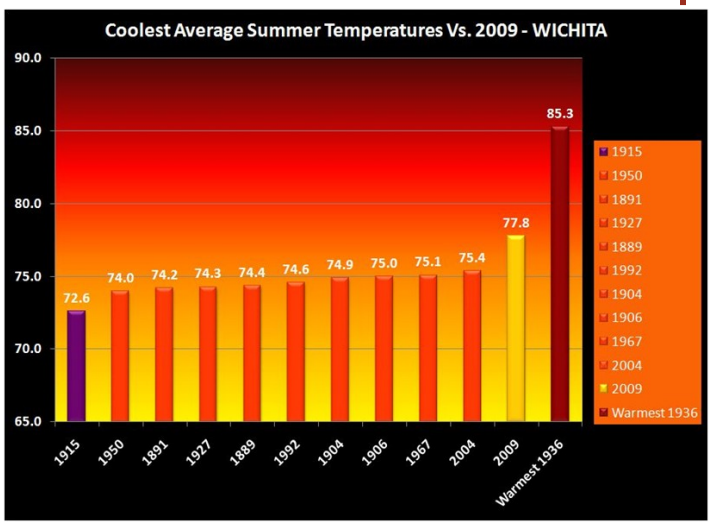


Image 2: Summer 2009 average temperature for Wichita compared to the 10 coolest summers on record.

In the department of rainfall, Wichita measured an even 12 inches at Mid-Continent during Summer 2009; 1.5 inches above normal and as one can tell, the rainfall was fairly evenly distributed. (Image 3) However,

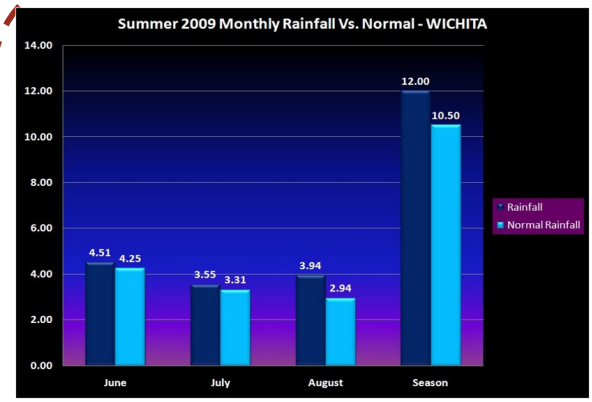


Image 3: Summer 2009 monthly rainfall for Wichita compared to normal.

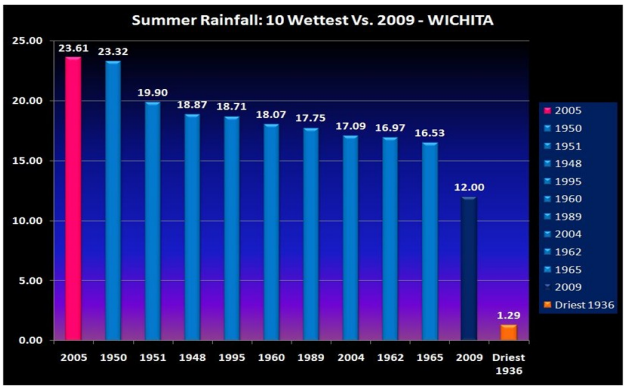


Image 4: Summer 2009 seasonal rainfall for Wichita compared to 10 wettest summers on record.

"Salina received above normal Precipitation, with 14.44 inches total during the summer"

2009 wasn't even close to gaining admission into the "Top 10 Wettest Summers" Fraternity, and was barely half the total (50.8%) of the "Raining King" of all summers: 2005. (Image 4.)

In summation, while it was quite cool with above normal rainfall, Summer 2009 was by no means "one for the record books".

Salina

Like Wichita, Salina had a warm start to Summer 2009, averaging 1.8 degrees above normal during the month of June. (Image 5) Then the weather REALLY COOLED OFF. The 76.6 degree average for July was a staggering 4.7 degrees below normal, enabling 2009 to finish in a tie for 6th coolest July on record. The 76.4 degree average also enabled Summer 2009 to tie 1982 for the 6th coolest summer on record. (Image 6)

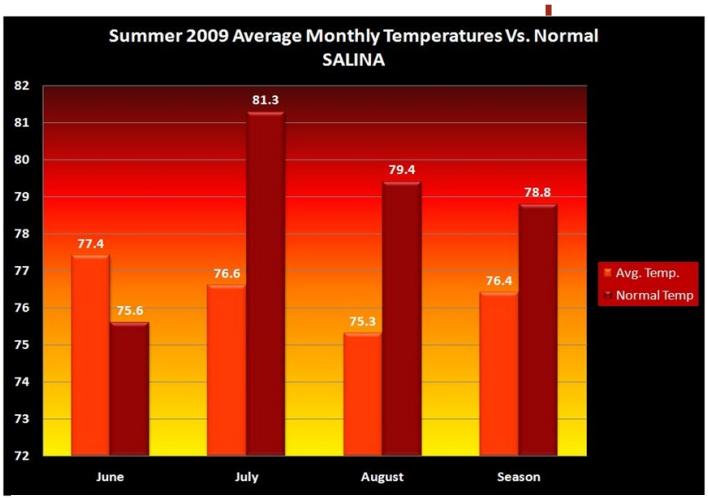


Image 5: Average monthly temperatures for Salina during summer 2009 compared to normal.

Regardless, the cooling trend continued through August, during which the average temperature was a "frosty" 4.1 degrees below normal. The 75.3 degree average made 2009 the 3rd coolest August on record. (Again, based on available data.)

Like Wichita, Salina also received above normal rainfall. The 14.44 inches measured was 2.48 inches above normal (Image 7) and made 2009 the 8th wettest summer on record. (Image 8) However, this ranking is very deceiving, especially when compared to the "Raining King" of all

IMPORTANT NOTE: Due to complications with Salina's climate history, this ranking is based on the available climate record dating to 1949 which of course does not encompass the 'Dust Bowl Era' of the 1930s. The National Weather Service is in the process of extending Salina's climate record back to 1895.

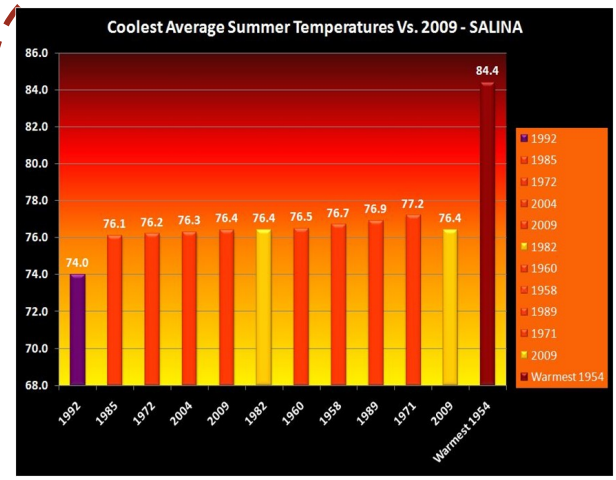


Image 6: Summer 2009 seasonal average temperature for Salina compared to 10 coolest summers on record.

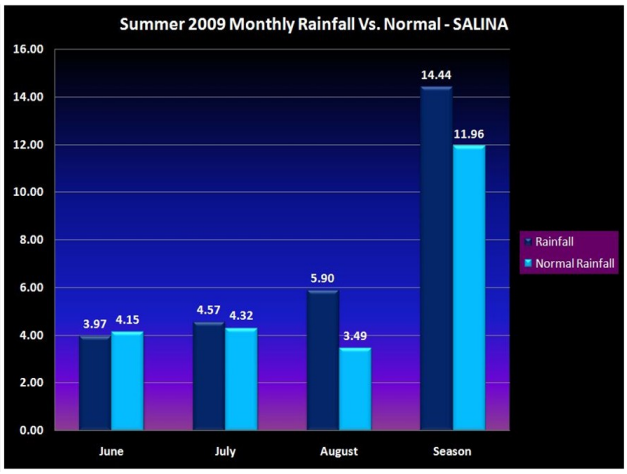


Image 7: Summer 2009 monthly rainfall for Salina compared to normal.

summers, 1993, during which a staggering 30.92 inches drenched the city. The 2009 total was only 46.7% of the historic 1993 total. Rainfall was actually very close to normal for most of the summer, but then August arrived and the skies "showered" Salina with considerable attention by dumping 5.90 inches on Schilling Field. (Image 7)

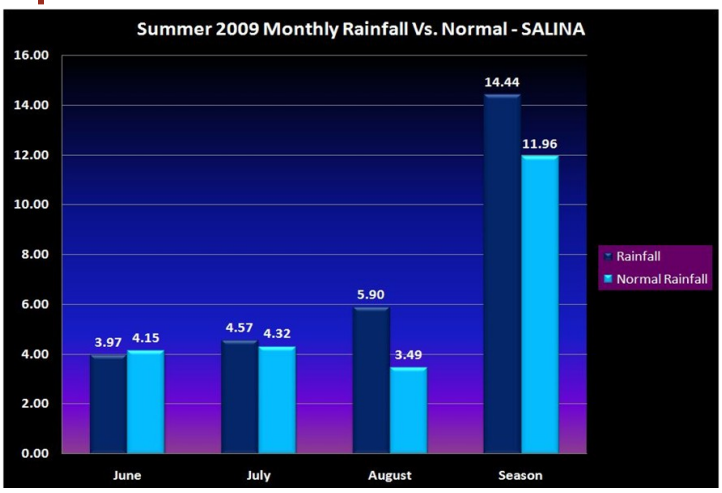


Image 8: Summer 2009 seasonal rainfall for Salina compared to 10 wettest summers on record.

Chanute

Chanute also experienced a warm start to the summer by averaging a lucky 77.7 degrees during the month of June; 3.4 degrees above normal. This tied 1922 for the 14th warmest June on record. However, just as it appeared air conditioners were going to get prolonged workouts, much cooler weather arrived with July averaging 3.6 degrees below normal and August 3.2 degrees below normal. (Image 9) The 75.9 degree average in July made 2009 the 6th coolest July on record, while the 74.8 degree average in August was the 7th coolest on record. However, like Wichita and Salina, June prevented 2009 from soaring through the ranks of the coolest summers on record, as the 76.1 degree average ranked 16th all-time. (Image 10 compares 2009 to the 10 coolest summers in Chanute's climate history.)

"Chanute's summer also started warm, ...but ended with the 7th coolest August on record."

In the water department, Chanute's rainfall trends were strikingly different from their Wichita and Salina cousins. Per image 11, June showered Chanute with considerable attention by soaking the town with 7.05 inches of rain; an even 2.0 inches above normal. Though impressive, this total was nowhere near gaining admission into the "Top 10 Fraternity", needing 2.43 inches to do so. The 3.70 inch total measured in July at Martin Johnson Airport was actually 0.54 inch below nor-

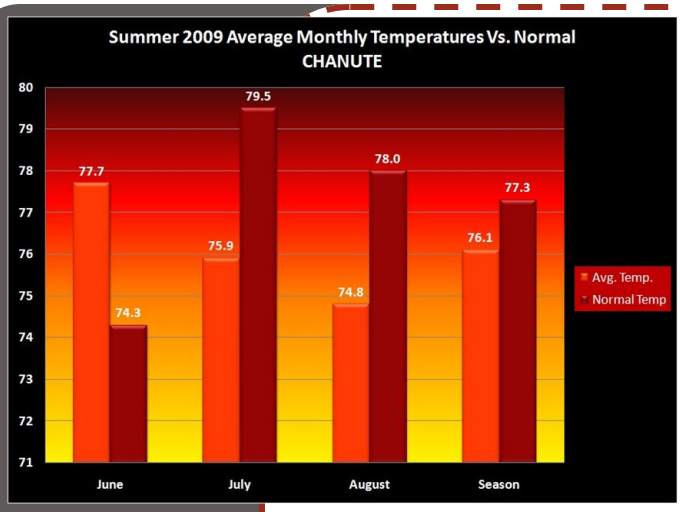


Image 9: Average monthly temperatures for Chanute during summer 2009 compared to normal.

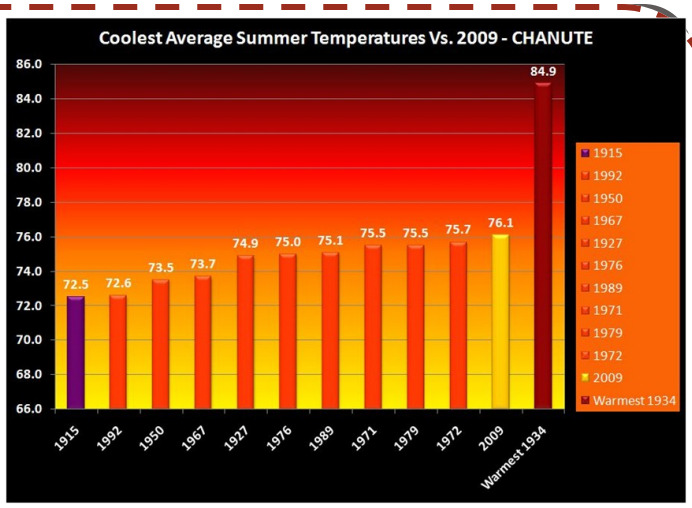


Image 10: Summer seasonal average temperature for Chanute compared to 10 coolest summers on record.

"The Summer months (June-August) were certainly cooler and wetter than normal"

mal, but then August "made amends" by pouring 5.03 inches. By examining the bar graph in image 12, one quickly notices that 2009 was light years shy of cracking the top 10 wettest summers on record, falling 4.21 inches behind the 10th place occupant, 1959 when, for all intents and purposes, 20 inches of rain drenched Martin Johnson Airport.

Summer Overview

In summation, Summer 2009 was certainly cooler and wetter than normal across the Wichita County Warning Area. However, with the exception of parts of Central Kansas, namely Salina, Summer 2009 was by no means historic, but one must keep in mind that the Autumn months have been known to produce some "gully washers", as the colossal rainfalls of last September and during Halloween 1998 clearly demonstrate, so keep those umbrellas handy and be alert for road closures during flooding situations.

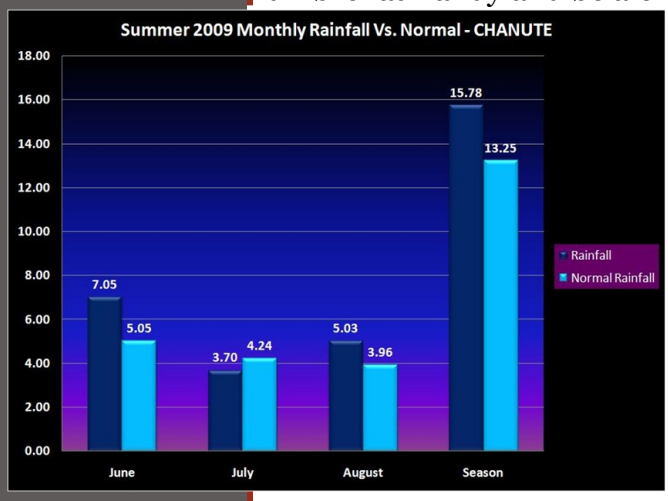


Image 11: Summer 2009 monthly rainfall for Chanute compared to normal.

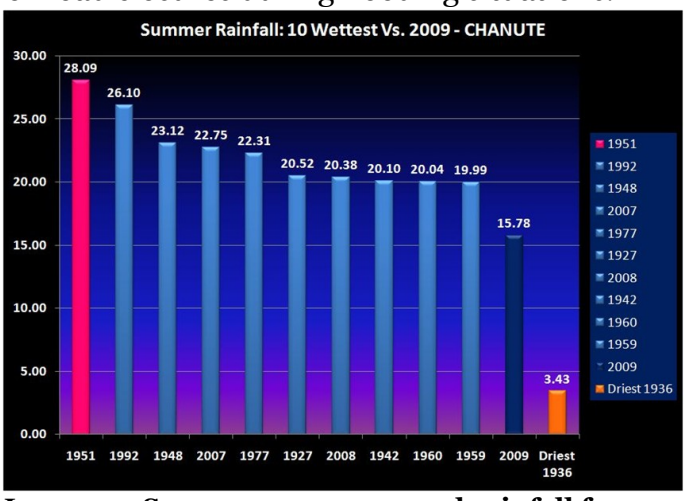


Image 12: Summer 2009 seasonal rainfall for Chanute compared to 10 wettest summers on record.

Speaking of September, most remember very well the historic rainfalls that drenched South-Central Kansas last year when Wichita experienced their 4th wettest month on record. For the first 10 days of the month, it appeared September 2009 would put on an encore performance and this time, nature would shower Southeast Kansas with considerable attention, as 7 to 10 inches soaked this sub-division. These amounts were 4 to 6 inches above September normals.

"The heaviest rains occurred...when 4 to 6.5 inches swamped the region"

Southeast Kansas had an especially soggy start to September. Of the 9.44 inches that soaked Chanute, 7.57 inches, or 80% of the monthly total, drenched the town between the 1st and the 10th. The 2.39 inches measured on the 2nd swamped the previous record of 1.40 inches set for the date way back in 1900! Of the 9.12 inch total measured in Parsons 7.46 inches (82% of the total) cascaded on the town over this same 10-day period. The 7.25 inches measured in Coffeyville are deceiving since the automated surface observing station was inoperative on the 21st when one and a half to two inches doused the region.

The heaviest rains occurred on the 8th and 9th when between 4 and 6.5 inches swamped the region. Flood warnings were issued for nearly all of Southeast Kansas both days. On the 8th and 9th, nature showered South-Central Kansas with plenty of attention as 4 to 7 inch rainfalls prompted flood warnings for most of these areas. The 3.83 inches measured at Wichita`s Mid-Continent Airport on the 8th set a record for the date, slightly more than doubling the previous record of 1.88 inches set in 1960. Nearby, Jabara Airport was drenched by a colossal 6.41 inches on the 8th. Little doubt residents of Wichita and surrounding areas were awash with memories of September 12th 2008 when staggering 5 to 12 inches of rain overwhelmed much of South-Central Kansas, causing horrific flooding and thousands of evacuations. The 6.41 inches measured at Jabara accounted for 74% of the September total for that airport.

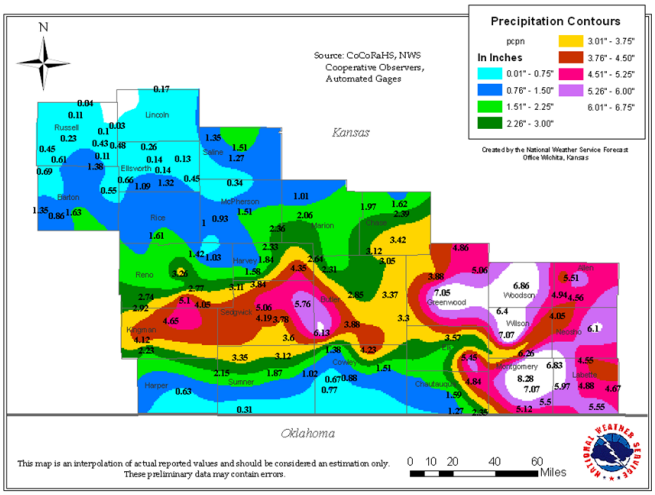


Image 13: Rainfall totals from September 7th-9th. Nearly all of the rainfall occurred on the 8th and 9th.

The 2-day rainfall totals in most of South-Central and Southeast Kansas for the 8th and 9th ranged from 4 to 8.3 inches with the greater amounts overwhelming Southeast Kansas. (Image 13.) September signed off in stellar fashion as a strong high pressure ridge dominated most of the Great Plains, to produce crystal clear skies and crisp temperatures for the most of the final 5 days of the month.

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Online: www. weather.gov/Wichita

NWS Wichita Word Search

Meteorological Events
NWS WICHITA, KS

Different types of Meteorological Events that occur throughout the World.

I	T	E	H	B	L	M	T	R	L	I	U	C	T	L	S	S
I	E	Y	W	A	C	G	K	S	D	R	A	Z	Z	I	L	B
N	N	P	P	L	B	C	U	T	U	O	P	S	D	N	A	L
R	R	I	S	H	H	O	N	L	O	N	S	U	O	E	N	I
A	O	E	Y	I	O	B	O	A	L	A	A	D	I	T	N	B
H	M	O	N	S	O	O	N	B	C	Y	E	M	O	D	Q	U
D	O	O	K	S	B	W	N	T	L	R	W	Z	I	Z	E	D
W	O	N	S	T	C	E	F	F	E	E	K	A	L	O	U	C
K	S	S	Q	S	U	C	R	C	N	V	N	O	S	S	T	L
W	L	E	U	R	R	H	H	M	N	S	O	I	T	H	U	H
H	O	H	A	U	R	O	O	H	U	R	R	D	L	L	E	R
O	T	D	L	B	O	O	F	M	F	D	E	M	B	Y	O	R
U	Z	A	L	N	R	K	M	B	O	V	A	R	A	U	R	S
U	E	O	L	W	T	E	E	M	I	S	S	H	L	E	A	D
O	R	W	I	O	R	C	E	L	R	Z	T	V	I	R	G	A
D	T	B	N	D	O	H	O	Z	O	L	E	E	L	G	M	E
E	I	C	E	S	T	O	R	M	E	D	R	O	U	G	H	T

Bermuda High
Derecho
Dust Devil
Hook Echo
Landspout
Squall Line

Blizzard
Downburst
Funnel Cloud
Ice Storm
Monsoon
Tsunami

Bow Echo
Drought
Gully Washer
Indian Summer
Noreaster
Typhoon

Chinook
Dry Line
Haboob
Lake Effect Snow
Sea Breeze
Virga

Answer Below: